signal and the output signal; and 2) a <u>drive circuit</u> responsive to the phase detector circuit and configured to maintain a fixed phase difference between the <u>input signal</u> and the <u>output signal</u> of the sensor.

The unique phase detector circuit detects the phase difference between the <u>input and output signal of the sensor</u>. The drive circuit is responsive to the phase detector circuit and maintains a <u>fixed phase difference</u> between the <u>input signal and the output signal of the sensor</u>. The applicants' independent claim 31 and 32 are method claims corresponding to the system defined in claims 1 and 17.

In contrast, Sauerland does not teach, suggest, or disclose a sensor readout circuit which includes a phase detector that is responsive to the <u>output signal from the sensor</u> and the <u>input signal to the sensor</u> and which is configured to detect a <u>phase difference</u> between the <u>input signal and the output signal</u>. Instead, Sauerland teaches and discloses a phase detector circuit which receives input from the <u>variable frequency source and the sensor</u>. Specifically, Sauerland discloses that the input to the phase detector is connected to the <u>outputs from the signal generator</u> and the sensor: "A signal from a <u>variable-frequency source</u> is divided by signal splitter 4 into two signals of equal phase on channels 6 and 8. Channel 6 <u>is directly connected to one input</u> of a quadrature <u>phase detector 10</u>. Channel 8 connects the other output of the signal splitter <u>with the other input of the phase detector</u> via the transmission network 12." Col. 2, line 41-46. Moreover, as shown in Fig. 1 of Sauerland, the phase detector circuit 10 is clearly shown <u>connected to the output from signal generator</u> 2 and the alleged sensor 16.

Clearly, as shown above, the alleged phase detector circuit as disclosed by Sauerland is <u>responsive</u> to the <u>input signal</u> split on line 6 <u>from the variable-frequency</u> source generator

and the output of the transmission network, which includes the alleged sensor. In sharp contrast, as recited above, the applicants' claimed phase detector circuit is responsive to the output signal from a sensor and the input signal from the sensor.

Moreover, Sauerland does not teach, suggest, or disclose a drive circuit responsive to the phase detector circuit configured to maintain a fixed phase between the input signal and the output signal of the sensor as recited in applicants' independent claims 1, 17, 21, 31 and 32. Instead, Sauerland teaches and discloses a drive circuit (utilization circuit 18, Fig. 4) which phase-locks the output signal from the detector output voltage and the signal generator: "Channel 32 contains network 46 which serves to process the detector output voltage such that it can be used for phase-locking the signal generator" Col. 3, line 65-68. Moreover, Sauerland teaches and discloses that the phase-locking is between the signal frequency of the variable frequency source and the resonator (the alleged sensor) by way of switch 24. Sauerland teaches removing the sensor and substitutions of it with a substitution resistor. *See* Col. 4, lines 4-21. Clearly, when the sensor is not present, the alleged drive circuit of Sauerland cannot maintain a fixed phase difference between the input and output signal of the sensor as recited in applicants' independent claims 1, 17, 21, 31 and 32.

Therefore, for the reasons stated above, Sauerland does not teach, suggest, or disclose each and every element of the applicants' claimed invention, namely, a sensor readout circuit which provides a frequency signal output which includes a phase detector responsive to the output signal from the sensor and the input signal to the sensor configured to detect the phase difference between the input signal and the output signal of the sensor, and a drive circuit responsive to the phase detector circuit which is configured to maintain a fixed phase difference between the input signal and the output signal of the sensor and the Examiner's

rejection of independent claims 1, 17, 21, 31 and 32, should be withdrawn.

Accordingly, applicants' independent claims 1, 17, 21, 31 and 32 are clearly allowable and patentable under 35 U.S.C. §102(b) over Sauerland. Because claims 2-6, 15, 16, 22-28, and 30 depend from allowable base claims, claims 2-6, 15, 16, 22-28, and 30 are allowable and patentable under 35 U.S.C. §102(b).

The Examiner rejects claims 1-8, 15-17, 21-28, and 30-32 under 35 U.S.C. §102(b) as being anticipated by White (U.S. Patent No. 5,444,641). The Examiner alleges that White discloses a readout circuit (READOUT ELECTRONICS, Fig. 15) that include a detector circuit (col. 10, lines 25-30) allegedly responsive to an output from a sensor (piezoelectric resonator) an input from a sensor in a drive circuit (161) responsive to the phase detector and configured to maintain a fixed phase difference between the input signal and the output signal.

As shown above, applicants' independent claims 1, 17, and 21 disclose a drive circuit responsive to the phase detector circuit which is configured to maintain a fixed phase difference between the <u>input signal and the output signal of the sensor</u>. Independent claims 31 and 32 disclose corresponding method claims to the system defined in claims 1 and 17.

In sharp contrast, White does not teach, suggest or disclose a <u>drive circuit responsive to the phase detector</u> which is configured to maintain a <u>fixed phase</u> difference between the <u>input and output signal</u> of the <u>sensor</u>. The alleged drive circuit 161, Fig. 15 of White is not even part of the alleged frequency read-out circuit. "READ-OUT ELECTRONICS" cited by the Examiner, and drive circuit 161 are separate and distinct parts of the circuit shown in Fig. 15. Moreover, the only function of the alleged drive circuit 161 of White is to <u>place a voltage across the drive-fork model</u> (the alleged sensor) the drive circuit: "The read-out

electronics 162 includes the integrator shown in Fig. 6, which presents a low impedance to the drive-fork model and indicates current from the drive-fork model. The drive electronics 161 places a voltage across the drive-fork model. Col. 9, line 65 – Col. 10, line 2. Moreover, the alleged phase detector circuit of White measures the frequency shift caused by extraneous variations in C_o and R which are compensated for by measuring C_o and measuring R and adjusting the phase shift in the drive loop of the sensor:

> "There is an additional frequency dependence of the angular rate signal Ω gain as a function of the difference between the resonant frequency of the drive fork and the resonant frequency of the pick-up fork. The values of L and C, for example, are determined primarily by the mass and elasticity of quartz, and the geometry of the resonator. Assuming then that the drive fork is driven at the "invariant" frequency of ω=1/(LC), then the admittance or transfer function of the drive fork is simply Y(s)=(RC_os+1)/R and the phase angle across the drive fork is arctan(RC_o107)$\approx$R$C_o\omega$. Therefore frequency shifts cause by extraneous variations in C_o and also R can be compensated for by measuring C_o and measuring R and adjusting the phase shift in the drive loop, as further described below, for a phase shift of arctan(R$C_o\omega$)$\approx$R$C_o\omega$ across the drive tines."

Col. 10, lines 13-29 of White, emphasis added.

Clearly, the C_o and R are related to the drive-fork model of the sensor and not the alleged phase detector circuit. As disclosed and taught by White, the drive-fork or sensor compensates for the frequency shift not the drive circuit as claimed by the applicants. Moreover, White's alleged phase detector measures signals from the drive circuit for adjusting the phase of the drive tines.

Accordingly, as shown above, White does not teach, suggest, or disclose each and every element of the applicants' claimed sensor read-out circuit as recited in independent claims 1, 17, 21, 31, and 32, namely, a drive circuit responsive to the phase detector circuit and configured to maintain a fixed phase difference between the input signal and output

signal of the sensor. Accordingly, applicants' independent claims 1, 17, 21, 31, and 32 are clearly allowable and patentable under 35 U.S.C. §102(b). Because claims 2-8, 15, 16, 22-28, and 30 depend from allowable base claims, claims 2-8, 15, 16, 22-28, 30 are clearly allowable and patentable under 35 U.S.C. §102(b).

The Examiner rejects claims 9-14, 18-20, and 29 under 35 U.S.C. §103(a) as being unpatentable over Sauerland. As recited above, Sauerland does not teach, suggest, or disclose each and every element of applicants' independent claims 1, 17, and 21. Applicants' independent claims 18 and 20 similarly recite that drive circuit is responsive to phase detector circuit and configured to maintain a fixed phase difference between the input and output signal of the sensor. Therefore Sauerland does not disclose each and every element of applicants' independent claims 18, and 20. Accordingly, applicants' independent claims 18 and 20 are allowable and patentable under 35 U.S.C. §103(a). Because claims 9-14, 19, and 29 depend from allowable base claims, claims 9-14, 19, and 29 are clearly allowable and patentable under 35 U.S.C. §103(a).

Each of the Examiner's rejections has been addressed or traversed. Accordingly, it is respectfully submitted that the application is in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this Response is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please telephone the undersigned or his associates, collect in Waltham, Massachusetts, at (781) 890-5678.

Respectfully submitted,

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